

What is claimed is:

1. A proximity sensor comprising:

a cylindrical outer shell case;

a detection coil assembly which includes a coil and a core and which is fitted to a front-end side of the outer shell case;

a plug-adaptable connector which is fitted to a rear-end side of the outer shell case; and

a circuit assembly which is disposed between the detection coil assembly and the connector and which incorporates an oscillation circuit using the coil as a resonant circuit element and an output circuit for generating an output signal based on the oscillating condition of the oscillation circuit, wherein

the connector comprises:

a conductive terminal assembly which includes a plug-adaptable conductive terminal electrically connected with the circuit assembly and a pin holder for holding the conductive terminal, and which is sized to be able to be inserted from the front-end side of the outer shell case; and

a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly to be inserted, which also has a joint part inside to enable the conductive terminal assembly to be positioned thereto, and which is fixed from the rear-end side of the outer shell case, and

the detection coil assembly and the conductive terminal assembly are electrically connected with each other with a

flexible connection member disposed therebetween.

2. The proximity sensor of claim 1, wherein  
the circuit assembly comprises:

a first circuit board containing a detection circuit which  
is equipped with the oscillation circuit using the coil of the  
detection coil assembly as the resonant circuit element and which  
generates an object detection signal according to the oscillating  
condition of the oscillation circuit; and

a second circuit board containing the output circuit which  
drives an output element based on the object detection signal,

the first circuit board is supported by and electrically  
connected with the detection coil assembly,

the second circuit board is supported by and electrically  
connected with the conductive terminal assembly, and

the first circuit board and the second circuit board are  
electrically connected with each other via the flexible  
connection member.

3. The proximity sensor of claim 1 or 2, wherein

the pin holder of the conductive terminal assembly is  
press-fitted into the joint part of the holding member, so as  
to position the conductive terminal assembly to the holding  
member.

4. A method for manufacturing a proximity sensor, comprising the steps of:

preparing a yet-to-be-completed product including: a detection coil assembly which includes a coil and a core; a circuit assembly which incorporates an oscillation circuit using the coil as a resonant circuit element and an output circuit for generating an output signal based on the oscillating condition of the oscillation circuit; and a conductive terminal assembly including a plug-adaptable conductive terminal held by a pin holder; the detection coil assembly, the circuit assembly and the conductive terminal assembly being electrically connected in this order by disposing at least one flexible connection member in the yet-to-be-completed product; a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly to be inserted and which also has a joint part inside to enable the conductive terminal assembly to be positioned to the holding member, and a cylindrical outer shell case for integrally accommodating the yet-to-be-completed product and the holding member;

inserting the yet-to-be-completed product from a front-end side of the outer shell case from the conductive terminal assembly side and press-fitting the detection coil assembly to the front-end side of the outer shell case;

press-fitting the holding member to a rear-end side of the outer shell case; and

fixing the conductive terminal assembly to the joint part of the holding member by moving the pin holder of the conductive terminal assembly inside the outer shell case through the openings of the holding member.

5. A method for manufacturing a proximity sensor, comprising the steps of:

preparing a yet-to-be-completed product including: a detection coil assembly which includes a coil and a core; a circuit assembly which incorporates an oscillation circuit using the coil as a resonant circuit element and an output circuit for generating an output signal based on the oscillating condition of the oscillation circuit; and a conductive terminal assembly which includes a plug-adaptable conductive terminal, a pin holder which holds the conductive terminal and is equipped with a through hole, and a pipe integral with the pin holder via a coupling part that can be cut easily and forming a resin flow path together with the through hole; the detection coil assembly, the circuit assembly and the conductive terminal assembly being electrically connected in this order by disposing at least one flexible connection member in the yet-to-be-completed product; a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly to be inserted and which also has a joint part inside so as to enable the conductive terminal assembly to be positioned to the holding

member; and a cylindrical outer shell case for integrally accommodating the yet-to-be-completed product and the holding member;

inserting the yet-to-be-completed product from a front-end side of the outer shell case from the conductive terminal assembly side and press-fitting the detection coil assembly to the front-end side of the outer shell case;

drawing the pipe of the conductive terminal assembly from the outer shell case and inserting into the holding member;

press-fitting the holding member to a rear-end side of the outer shell case;

fixing the conductive terminal assembly to the joint part of the holding member by manipulating the pipe inserted into the holding member;

filling resin into the outer shell case through the pipe;  
and

detaching the pipe from the conductive terminal assembly.

6. A method for manufacturing a proximity sensor, comprising the steps of:

preparing a yet-to-be-completed product including: a detection coil assembly which includes a coil and a core; a circuit assembly which includes a detection circuit board containing an oscillation circuit using the coil as a resonant circuit element and a detection circuit for generating an object

detection output signal according to the oscillating condition of the oscillation circuit, and an output circuit board containing an output circuit for driving an output element based on the object detection output signal, the detection circuit board and the output circuit board being electrically connected with each other by a flexible connection part disposed therebetween; and a conductive terminal assembly including a plug-adaptable conductive terminal held by a pin holder; the detection coil assembly, the circuit assembly and the conductive terminal assembly being electrically connected with each other; a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly to be inserted and which also has a joint part inside to enable the conductive terminal assembly to be positioned to the holding member; and a cylindrical outer shell case for integrally accommodating the yet-to-be-completed product and the holding member;

inserting the yet-to-be-completed product from a front-end side of the outer shell case from the conductive terminal assembly side and press-fitting the detection coil assembly through a coil case to the front-end side of the outer shell case;

press-fitting the holding member to a rear-end side of the outer shell case; and

fixing the conductive terminal assembly to the joint part of the holding member by moving the pin holder of the conductive

terminal assembly inside the outer shell case through the openings of the holding member.

7. A method for manufacturing a proximity sensor, comprising the steps of:

preparing a yet-to-be-completed product including: a detection coil assembly which includes a coil and a core; a circuit assembly which includes a detection circuit board containing an oscillation circuit using the coil as a resonant circuit element and a detection circuit for generating an object detection output signal according to the oscillating condition of the oscillation circuit, and an output circuit board containing an output circuit for driving an output element based on the object detection output signal, the detection circuit board and the output circuit board being electrically connected with each other by a flexible connection part disposed therebetween; and a conductive terminal assembly which includes a plug-adaptable conductive terminal, a pin holder which holds the conductive terminal and is equipped with a through hole, and a pipe integral with the pin holder via a coupling part that can be cut easily and forming a resin flow path together with the through hole; a cylindrical holding member which has openings at both ends so as to enable the conductive terminal assembly to be inserted and which also has a joint part inside so as to enable the conductive terminal assembly to be positioned to the

holding member; and a cylindrical outer shell case for integrally accommodating the yet-to-be-completed product and the holding member;

inserting the yet-to-be-completed product from a front-end side of the outer shell case from the conductive terminal assembly side and press-fitting the detection coil assembly to the front-end side of the outer shell case;

drawing the pipe of the conductive terminal assembly from the outer shell case and inserting into the holding member;

press-fitting the holding member to a rear-end side of the outer shell case;

fixing the conductive terminal assembly to the joint part of the holding member by manipulating the pipe inserted into the holding member;

filling resin into the outer shell case through the pipe;  
and

detaching the pipe from the conductive terminal assembly.

8. A method for manufacturing a proximity sensor, the method enabling the manufacture of proximity sensors of different outer diameters by using:

a kind of connector comprising a terminal assembly having a pin holder for holding a plug-adaptable conductive terminal and a cylindrical holding member having openings at both ends so as to enable the conductive terminal assembly to be inserted



therein from one of the openings and which also has a joint part inside so as to enable the conductive terminal assembly to be positioned to the holding member, the conductive terminal assembly and the holding member being integrated via the joint part;

plural kinds of outer shell cases of different outer diameters which are designed so as to enable the holding member to be fixed from a rear-end side of the plural kinds of outer shell cases and the conductive terminal assembly to be inserted from a front-end side of the plural kinds of outer shell cases so as to be connected with the holding member.